

Claims

- [c1] 1. A radio frequency temperature sensor, comprising:
a ring oscillator, adapted to generate an oscillating signal frequency varying corresponding to a measured temperature;
a memory, adapted to store an initial value;
a frequency counter, coupled to the memory and the ring oscillator and adapted to measure a temperature error in response to the measured temperature according to the initial value and the oscillating signal in a pre-set time;
a radio frequency transmission interface, serving as a transmission interface with a card reader; and
a micro-controller, coupled to the frequency counter, the memory and the radio frequency transmission interface, adapted to transmit the initial value to the frequency counter, control starting and ending of the pre-set time, read the temperature error and communicate with the card reader through the radio frequency transmission interface.
- [c2] 2. The radio frequency temperature sensor of claim 1, wherein the ring oscillator comprises:
a thermal resistor, having a first terminal and a second

terminal;

a capacitor, having a first terminal and a second terminal, the first terminal of the capacitor coupled to the second terminal of the thermal resistor, and the second terminal of the capacitor grounded;

a Schmitt inverter, having an input terminal coupled to the second terminal of the thermal resistor, and an output terminal;

an inverter, having an input terminal coupled to the output terminal of the Schmitt inverter, and an output terminal; and

a NAND gate, having a first input terminal, a second input terminal and an output terminal, the first input terminal of the NAND gate adapted to receive an enable signal, the output terminal coupled to the first terminal of the thermal resistor, the second input terminal coupled to the output terminal of the inverter and adapted to output the oscillating signal.

- [c3] 3. The radio frequency temperature sensor of claim 1, wherein the memory is a non-volatile memory.
- [c4] 4. The radio frequency temperature sensor of claim 1, wherein the frequency counter is a down counter.
- [c5] 5. The radio frequency temperature sensor of claim 1, wherein the radio frequency transmission interface com-

prises:

an antenna, comprising an inductor coupled to a capacitor in parallel;

a diode, an anode of the diode coupled to a terminal of the antenna; and

a Zener diode, an anode of the Zener diode coupled to another terminal of the antenna, a cathode of the Zener diode coupled to a cathode of the diode.

[c6] 6. The radio frequency temperature sensor of claim 1, wherein the micro-controller transforms the temperature error into the measured temperature according to a temperature reference table.

[c7] 7. The radio frequency temperature sensor of claim 1, wherein the micro-controller communicates with the card reader through a general input/output port thereof.

[c8] 8. A method of calibrating temperature, adapted for a radio frequency temperature sensor comprising a ring oscillator, a memory and a frequency counter, the method comprising:
generating an oscillating signal corresponding to a standard measured temperature by the ring oscillator;
measuring a frequency count value of the frequency counter according to the oscillating signal in a pre-set time; and

storing the frequency count value in the memory as a initial value of the frequency counter.

- [c9] 9. A radio frequency temperature sensor, comprising:
- a regulator, adapted to receive and transform a oscillating current from an antenna into a working voltage of the radio frequency temperature sensor;
 - a frequency extractor, adapted to generate a clock signal of the radio frequency temperature sensor according to a signal received from the antenna;
 - a ring oscillator, adapted to generate an oscillating signal frequency corresponding to a measured temperature;
 - a memory, adapted to store a initial value;
 - a frequency counter, coupled to the memory and the ring oscillator and adapted to measure a temperature error in response with the measured temperature according to the initial value and the oscillating signal in a pre-set time;
 - a modulator serving as a transmission interface with a card reader; and
 - a state machine, coupled to the frequency counter, the memory and the modulator, adapted to transmit the initial value to the frequency counter, control starting and ending of the pre-set time, read the temperature error and communicate with the card reader through the modulator.

[c10] 10. The radio frequency temperature sensor of claim 9, wherein the ring oscillator comprises:
a thermal resistor, having a first terminal and a second terminal;
a capacitor, having a first terminal and a second terminal, the first terminal of the capacitor coupled to the second terminal of the thermal resistor, and the second terminal of the capacitor grounded;
a Schmitt inverter, having an input terminal coupled to the second terminal of the thermal resistor, and an output terminal;
an inverter, having an input terminal coupled to the output terminal of the Schmitt inverter, and an output terminal; and
a NAND gate, having a first input terminal, a second input terminal and an output terminal, the first input terminal of the NAND gate adapted to receive an enable signal, the output terminal coupled to the first terminal of the thermal resistor, the second input terminal coupled to the output terminal of the inverter and adapted to output the oscillating signal.

[c11] 11. The radio frequency temperature sensor of claim 9, wherein the memory is a non-volatile memory.

[c12] 12. The radio frequency temperature sensor of claim 9,

wherein the frequency counter is a down counter.